[useAMS]fmf2e

-.3ex<∼ -.3ex>∼ $M_{\odot} P_{orb} \dot{M}$

[SXT outbursts] The origin of the rebrightening in soft X-ray transient outbursts [M. R. Truss et al] M. R. TrussE-mail : mtr@star.le.ac.uk, G. A. Wynn, J. R. Murray and A. R. King

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abstract We present a model of an outburst of the soft X-ray transient A0620-003. A two-dimensional time-dependent smoothed particle hydrodynamics scheme is used to simulate the evolution of the accretion disc through a complete outburst. The scheme includes the full tidal potential of the binary and a simple treatment of the thermal-viscous disc instability. In the case where the mass accretion rate onto the primary determines the fraction of the disc that can be kept in a hot, high viscosity state by the resulting X-ray emission, we find that the shape of the X-ray light curve is ultimately determined by the relative sizes of the irradiated and unirradiated parts of the disc and the growth time-scale of the tidal instability. The model accounts for the rebrightening that has been observed in the light curves of A0620-003 and several other transients. The primary maximum and subsequent decline are due to the accretion of gas within the irradiated portion of the disc, while the secondary maximum is caused by the accretion of gas in the outer part of the disc that is initially shadowed from the central X-rays, but subject to tidal forces. We propose that tidal effects at the disc edge can be sufficient to drive accretion on a time-scale shorter than that expected for a standard alpha-viscosity disc. The final decay is subsequently controlled by the gradual retreat of the irradiated portion of the disc. If the entire disc is kept in the high-viscosity state by the irradiation, no rebrightening is possible.